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10/729,357	12/05/2003	John Klocke	291958238US	8259

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EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1742

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/729,357

Applicant(s)

KLOCKE ET AL.

Examiner

Harry D. Wilkins, III

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 7,21,28 and 32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-20,22-27,29-31 and 33-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 8/19/05, 5/22/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-36 and Species Ia, a non-porous/semipermeable barrier being a cation-selective exchange barrier in the reply filed on 8 September 2006 is acknowledged. Accordingly, claims 7, 21, 28 and 31 are withdrawn from consideration as being drawn to a non-elected invention. (Note that 28 was not noted by Applicant as being drawn to a non-elected species, but claim 28 is directed to the porous barrier species.)

Claim Interpretation

2. In claim 24, there is a "barrier unit between the processing and electrode units" and the first flow system and the second flow system each include portions within the barrier unit. Although Applicant discloses a separate barrier unit (e.g.-260), no physical shape of the barrier unit has been claimed such that the claim is not limited to the specific embodiment disclosed.
3. Additionally, certain claims (11-13, 25-26, 29, 32 and 34-36) contain limitations related to the composition of the electrolytes utilized within the structure of the invention.

As per MPEP 2115:

"Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, "[i]nclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." *In re Young*, 75 F.2d 996, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

As such, the limitations relating to the composition of the electrolytes utilized within the electroplating/electroetching cell have not been given any patentable weight since they fail to further limit the structure of the claimed apparatus.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-6, 8-16, 18-20, 22-27, 29-30 and 32 are rejected under 35

U.S.C. 102(b) as being clearly anticipated by Woodruff et al (US 2001/0032788).

Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) an electroplating chamber including a processing chamber (e.g.-400) including a first flow system configured to convey a flow of a first processing fluid to a microfeature workpiece, an electrode unit (e.g.-600) coupled to the processing unit, the electrode unit including a plurality of electrodes and a second flow system configured to convey a flow of a second processing fluid at least proximate to the electrode and a non-porous barrier (e.g.-700) between the processing unit and the electrode unit to separate the first and second processing fluids, the non-porous barrier being a material that allowed cations to pass through the barrier between the first and second processing fluids.

Regarding claim 2, the cell of Woodruff et al included multiple anodes, each separated from the other by a dielectric divider (e.g.-500).

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Regarding claim 3, the cell of Woodruff et al included a field shaping module (e.g.-536) to shape an electrical field in the first processing fluid induced by the concentric electrodes.

Regarding claims 4-6, the membrane (700) of Woodruff et al was a cation exchange membrane that separated the flow of the first and second processing fluids.

Regarding claim 8, the membrane (700) of Woodruff et al permitted electrical current to pass through by action of the transfer of ions.

Regarding claims 9 and 10, Woodruff et al teach that the electrodes could be operated independently of each other to control the corresponding electric field.

Regarding claim 14, Woodruff et al teach (see paragraph 84) that the interface member (e.g.-710) including the cation exchange membrane could be arranged with a slight tilt to force bubbles out of the second processing fluid.

Regarding claim 15, the cell of Woodruff et al included a "barrier unit" (interface member (e.g.-710)) coupled to the processing and electrode units, wherein the barrier unit included the non-porous barrier.

Regarding claim 18, Woodruff et al teach (see paragraph 86) using phosphorous-doped copper anodes.

Regarding claim 19, Woodruff et al teach (see figures 3 and 4) including a head assembly (e.g.-160) including a workpiece holder as claimed. The apparatus also had a vessel including a processing unit, electrode unit and semi-permeable barrier as claimed.

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Regarding claim 24, the cell of Woodruff et al included a "barrier unit" (interface member (e.g.-710)) coupled to the processing and electrode units, wherein the barrier unit included the non-porous barrier. The interface member included at least some portion both the catholyte and anolyte within its confines, separated by the cation exchange membrane. See, e.g.-figures 9A and 9B of Woodruff et al where there is some amount of space within the openings (732 and 742) which would be "in" the barrier unit. These spaces were filled with first and second processing fluids as claimed.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 17 and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodruff et al (US 2001/0032788).

Woodruff et al teach (see figures 4, 7A-7D, 8 and 9A and paragraphs 57 and 81-89) a system for wet chemical processing of microfeature workpieces including a processing unit for providing a first electrolyte to a microfeature workpiece, an electrode unit for carrying a second electrolyte and an electrode proximate to the second electrolyte and a semipermeable barrier between the processing unit and the electrode unit to separate the second electrolyte and the first electrolyte while permitting cations to pass between the second and first electrolytes.

Thus, Woodruff et al fail to expressly teach including reservoirs for storing the first and second electrolytes, as claimed.

However, Woodruff et al do teach (see paragraph 88) that the catholyte (first electrolyte) and the anolyte (second electrolyte) were maintained as separate compositions and the distributor (300) was capable of feeding different compositions to each of the processing unit and the electrode unit.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a first reservoir in fluid communication with the processing unit and a second reservoir in fluid communication with the electrode unit for the purpose of providing a continuous flow of electrolyte through the electroplating cell.

With respect to the limitation that the total volume of the first electrolyte was at least twice the total volume of the second electrolyte, changes in size have been held to be prima facie obvious absent a showing of unexpected results. See MPEP 2144.04.IV.A. Further, the claimed is defined that the first reservoir and the processing unit are "configured to carry a first volume of the first electrolyte" and the second

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reservoir and the electrode unit are "configured to carry a second volume of the second electrolyte". Two tanks of the same size are "configured" to carry different volumes since that limitation is related to the manner in which the structures are used. See MPEP 2114.

Regarding claim 17, it would have been within the ability of one of ordinary skill in the art to have selected pure copper as the material for the anodes instead of phosphorous-doped copper because pure copper anodes were well known within the art of copper electroplating on electronic workpieces to be suitable alternatives to phosphorous-doped copper. See Lu et al (US 2002/0195351) in paragraph 25.

9. Claims 1, 3-6, 8, 10-13, 15-20, 24-27, 29, 30, 32-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094).

Calhoun et al teach (see figures 2 and 3 and cols. 5-12) an electrochemical deposition chamber including a processing unit (60) including a first flow system to convey a flow of a catholyte to a microfeature workpiece, an electrode unit (55) coupled to the processing unit including an electrode and a second flow system to convey a flow of an anolyte to the electrode and a nonporous barrier (100) which permitted cations to pass through between the catholyte and anolyte.

Calhoun et al teach using a single anode electrode and not a plurality of anodes.

Inagaki teaches (see pages 16-17 of English translation) utilizing multiple anodes, operable at different current densities, to control the thickness of electroplated material on the cathode, particularly to achieve more uniform electroplated thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have formed the anode electrode of Calhoun et al into several anode segments as suggested by Inagaki because the anode segments would have permitted more precise control of the electroplated metal layer thickness.

Regarding claim 3, the cell of Woodruff et al included a field shaping module (e.g.-536) to shape an electrical field in the first processing fluid induced by the concentric electrodes.

Regarding claims 4-6, the membrane of Calhoun et al was a cation exchange membrane that separated the flow of the first and second processing fluids.

Regarding claim 8, the membrane of Calhoun et al permitted electrical current to pass through by action of the transfer of ions.

Regarding claim 10, Inagaki teach that the electrodes could be operated independently of each other to control the corresponding electric field.

Regarding claim 15, the cell of Calhoun et al included a "barrier unit" (membrane) coupled to the processing and electrode units, wherein the barrier unit included the barrier.

Regarding claims 17 and 18, Calhoun et al teach (see col. 1, lines 12-32 and paragraph spanning cols. 4 and 5) that the cell was capable of use for electroplating of copper, but provides no further details as to how to accomplish it. It was well known within the art of electroplating on electronic workpieces that for electroplating copper, consumable anodes of either high-purity copper or phosphorous doped copper were suitable. See Lu et al (US 2002/0195351) in paragraph 25. Therefore, it would have

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been obvious to one of ordinary skill in the art to have made the electrode from either one of the conventional electrode materials for performing the electroplating of copper.

Regarding claim 19, the apparatus of Calhoun et al included a head assembly (50) including a workpiece holder configured to position a workpiece at a processing site and a plurality of electrical contacts arranged to provide electrical current to a layer on the workpiece.

Regarding claim 24, it would have been obvious to one of ordinary skill in the art to have constructed the barrier unit in such a shape that it contained portions of both the anolyte and the catholyte within its boundaries.

Regarding claims 33-36, Calhoun et al teach (see figures 2 and 3 and cols. 5-12) a system for wet chemical processing of microfeature workpieces including a processing unit for providing a catholyte to a microfeature workpiece, an electrode unit for carrying an anolyte and an electrode proximate to the anolyte and a semipermeable barrier (cation exchange membrane) between the processing unit and the electrode unit to separate the anolyte and the catholyte while permitting cations to pass between the two. Inagaki (discussed above) provide motivation for providing an electrode unit with a plurality of electrodes.

Thus, Calhoun et al fail to expressly teach including reservoirs for storing the catholyte and anolyte, as claimed.

However, Calhoun et al do teach (see cols. 8-9) that the catholyte (first electrolyte) and the anolyte (second electrolyte) were maintained as separate compositions.

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Therefore, it would have been obvious to one of ordinary skill in the art to have added a first reservoir in fluid communication with the processing unit and a second reservoir in fluid communication with the electrode unit for the purpose of providing a continuous flow of electrolyte through the electroplating cell.

With respect to the limitation that the total volume of the first electrolyte was at least twice the total volume of the second electrolyte, changes in size have been held to be prima facie obvious absent a showing of unexpected results. See MPEP 2144.04.IV.A. Further, the claimed is defined that the first reservoir and the processing unit are "configured to carry a first volume of the first electrolyte" and the second reservoir and the electrode unit are "configured to carry a second volume of the second electrolyte". Two tanks of the same size are "configured" to carry different volumes since that limitation is related to the manner in which the structures are used. See MPEP 2114.

10. Claims 2 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094) as applied above to claim 1 and further in view of Wang (US 6,391,166).

Calhoun et al and Wang teach using multiple anode electrode.

However, Calhoun et al and Wang fail to suggest including dielectric dividers between the multiple anodes.

Wang show (see figures) utilizing dielectric dividers between multiple adjacent concentric anodes in an electroplating device.

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Therefore, it would have been obvious to one of ordinary skill in the art to have added dielectric dividers between the adjacent anodes of Calhoun et al and Inagaki as suggested by Wang because the dividers would have reduced interactions in the current density between the multiple anodes.

11. Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094) as applied above to claim 1 and further in view of Poris (US 5,256,274).

Calhoun et al and Inagaki do not teach using a field shaping module.

Poris teaches (see figures 9, 11A and 11B and col. 10, lines 4-55) utilizing a field shaping virtual anode, for controlling the current density at the surface of the cathode to control the thickness of electroplated material on the cathode, particularly to achieve more uniform electroplated thickness.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a field shaping unit to the apparatus of Calhoun et al as suggested by Poris because the field shaping unit would have permitted more precise control of the electroplated metal layer thickness.

12. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Calhoun et al (US 5,883,762) in view of Inagaki (JP 59-150094) as applied above to claim 1, and further in view of Reid et al (US 6,126,798).

Calhoun et al do not teach the non-porous barrier being canted relative to the processing unit to vent gas from the second processing fluid.

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Reid et al teach (see figure 2 and col. 3, lines 22-40) utilizing a membrane disposed between an anode and a cathode (workpiece), wherein the membrane was tilted with respect to the processing plane of the workpiece to permit gas bubbles forming on the anodes to escape at the outer perimeter of the membrane.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the membrane of Calhoun et al to be tilted with respect to the processing plane of the workpiece as suggested by Reid et al because the tilt would have permitted gas bubbles forming on the anode from escaping.

Double Patenting

13. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

14. Claims 1-6, 8-20, 22-27, 29-31 and 33-36 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over

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claims 1-35 of copending Application No. 10/729,349. Although the conflicting claims are not identical, they are not patentably distinct from each other because each and every claim limitation of the claims are present within claims of the '349 Application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

15. Claims 1-6, 8-20, 22-27, 29-31 and 33-36 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 2-12, 22-29, 48-51, 54-56 and 65 of copending Application No. 09/872,151.

Although the conflicting claims are not identical, they are not patentably distinct from each other because each and every claim limitation of the claims are present within claims of the '151 Application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Harry D Wilkins, III
Primary Examiner
Art Unit 1742

hdw